January 2021

ARMY COMMUNICATOR

A New Year of Communicating Opportunities

Plus:

- ***Project Warrior***
- ***Information Warfare***
- ***Signal History***

FROM THE CIVIL WAR TO WINNING IN THE ERA OF GREAT POWER COMPETITION
U.S. ARMY SIGNAL CORPS
1860 - 2020
160 YEARS OF EXCELLENCE

Contents

The Army Communicator is published as a command information e-publication for the men and women of the United States Army Signal Corps under the provisions of AR 360-1.

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COL John T. Batson
Signal School Commandant

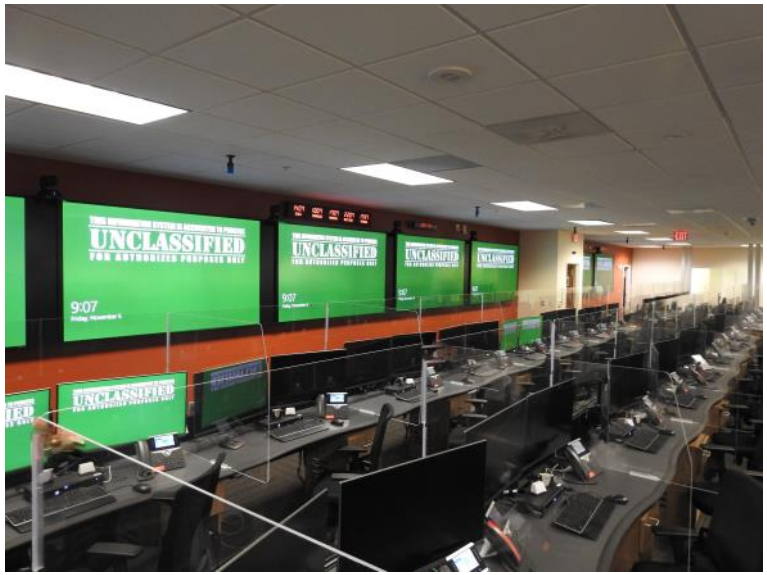
CSM Darien D. Lawshea
Signal Corps Regimental Command Sergeant Major

CW5 Garth R. Hahn
Signal Corps Regimental Chief Warrant Officer

Nicholas M. Spinelli
Editor-in-Chief

On the Cover

United State Southern Command Network Operations Center, JBSA-Fort Sam Houston, Texas.
US Army photo



Signal Regimental Team

Happy New Year! We hope that each of you enjoyed the holidays and were able to celebrate, relax, and enjoy time with family and friends. The New Year is traditionally a time to reflect on the past year and resolve to improve in the next. Although the challenges of 2020 were faced the world over, together, our dispersed team of Signal Soldiers and Leaders met each challenge with professionalism and a determination to overcome.

Booker T. Washington once said, “Success is to be measured not so much by the position that one has reached in life as by the obstacle which he has overcome.” We did more than simply overcome, we reacted, adapted, and developed new and efficient ways of conducting operations; and we’re excited to carry that momentum of progress and innovation into 2021.

The Signal Corps is the tip of the spear when it comes to finding new and better ways to connect and pass information. From the earliest days of Wig-Wags to our current utilization of Big Data and Cloud Computing, Signal continues to pioneer the communication field. This year, I believe we will achieve greater heights, establish new standards, and pave the way for the future of the force.

Much of this promise is explored in this – and every issue – of the Communicator. This is the venue for the Signal Regiment to explore the latest technologies, learn about upcoming initiatives, and celebrate the men and women who make up our team of professionals. If you have any ideas, suggestions, or submissions for future issues, let us know. And remember, stay safe, remain vigilant in all that you do, and take ownership of your situation to improve the lives of your Battle Buddies, your Family, and Yourself! Know that you are a valued member of a time-honored team and CSM Lawshea, CW5 Hahn, and I are very appreciative of your dedication to defending our great Nation.

Now, let’s have a great year! Pro Patria Vigilans!

COL John T. Batson
Signal School
Commandant

CSM Darien D. Lawshea
Regimental CSM

CW5 Garth R. Hahn
Regimental CWO

Cyber, IT leaders focus on proper resourcing to win future fight

Devon Suits
Army News Service

Close to 250 Army civilians supporting information technology and cyber missions are now training under the Army's Quantum Leap pilot program, as leaders continue to refine the initiative to meet future demands.

Earlier this year, the Army announced Quantum Leap as a means to recode, reskill and upskill about 1,000 existing IT positions by fiscal year 2023, said Gregory Garcia, the Army's deputy chief information officer.

"The Army's priorities are focused on people, readiness and modernization," Garcia said on Nov. 19 during the AFCEA Belvoir Industry Days event. "We have coupled that with the Department of Defense's push for cyber, cloud, data, [artificial intelligence], and C3," or command, control, and communication.

Army G-6 leaders are currently working to create a unified network by collapsing the divide between the enterprise and tactical systems. Photo by Spc. TaMaya Eberhart

The current IT workforce needs to expand its existing skillsets to support the DOD's drive for new capabilities, Garcia said, adding programs like Quantum Leap are necessary to keep the Army competitive and deter future conflict.

With the recent success of the Quantum Leap pilot, which began in September and is expected to run for a year, program officials are now seeking more opportunities, including extending the program to support Soldiers and civilians across a wider range of cyber and IT fields, Garcia said.

Thus far, personnel have averaged approximately 14 hours of training and completed nearly 200 bodies of work, with many receiving new certifications in various cyber or network-related disciplines, said Garcia, citing recent program data.

"We started this out with a civilian population, but it is spreading rapidly to [other missions] throughout the Army," Garcia said. "Quantum Leap is focused on bringing skills" to support emerging IT requirements.

The Army recently realigned its CIO/G-6 position into two separate roles to meet current and future multi-domain operational requirements within the cyber and IT space, said Lt. Gen. John B. Morrison Jr., the Army deputy chief of staff, G-6.

As the new G-6, Morrison is responsible for the plan-

ning, strategy, network architecture, and implementation of both CIO policy and the Army's enterprise and tactical networks.

Proper implementation of C3, network architecture, and cyber operations are vital to worldwide operations, he said, and allow the force to "execute violently" when needed.

"We certainly need to understand where we're going," Morrison said. "Our look is two to three years out, but we still keep our eye on the long game" to support the multi-domain battlespace.

Realignment of the CIO/G-6 position will be critical to the Army's future success, Morrison added. The force now has two offices dedicated to the vertical and horizontal integration of cyber and IT assets. This change is necessary to bridge the gap between policy development, implementation and execution.

To support current efforts, the G-6 office will push forward under four pillars, he said. In the first, leaders aim to create a unified network by collapsing the divide between the enterprise and tactical systems.

Bridging the two networks will be necessary to support multi-domain operations and the Army's modernization priorities, he said. Doing so will ensure the right echelon is receiving the right data at the correct time.

"Cyber effects are going to be deployed around the globe and into a theater of operations" to enable tactical effects, Morrison said. "We have got to set that unified network so that we can compete and win."

Along with a unified network, the G-6 office is working to posture and train its signal and cyber branches to support the future battlespace, he said. Current efforts include the transition of expeditionary signal battalions to more agile ESB-enhanced units to increase each formation's capability.

The enhanced units are modular, scalable, and provide alternative tactical network equipment to reduce the Army's reliance on the Warfighter Information Network-Tactical, according to Program Executive Office Command, Control and Communications-Tactical officials.

The 50th ESB, 35th Theater Tactical Signal Brigade at Fort Bragg, North Carolina, was the first pilot unit selected in 2018.

ESB-E capabilities will aid the Army's ability to support DOD Information Network operations, or DODIN ops, Morrison said.

"From the global perspective, all the way down to the tactical level, building that DODIN ops framework to synchronize and integrate operations at echelon to react to an adversary in the cyber and electromagnetic spectrum is paramount," he said.

The G-6's third and fourth pillars include reforming cybersecurity processes, along with a need to drive efficient investments in network and cyber capabilities.

Currently, officials are working on a new model to measure cybersecurity risk after a new system, application or capability is added to the Army's network, Morrison said. This new model will also decrease bureaucracy tied to current security authorization processes early in the evaluation process, all while simultaneously integrating measures to protect network capabilities.

Army fast-tracks radars for congested environments

US Army DEVCOM Army Research Laboratory Public Affairs

Army researchers used machine learning to improve radars for spectrum dominance..
Courtesy graphic

A new machine learning approach could improve radar performance in congested environments.

Researchers from the U.S. Army Combat Capabilities Development Command, now known as DEVCOM, Army Research Laboratory and Virginia Tech developed an automatic way for radars to seamlessly operate in congested and limited spectrum environments created by commercial 4G LTE and future 5G communications systems.

"Future implementations of this algorithm into Army legacy and developmental radars will provide unprecedented spectrum dominance for Soldiers," said Army researcher Dr. Anthony Martone. "This will enable Soldiers to use their radars for problems such as tracking incoming targets while mitigating interference to maximize target detection range."

The researchers examined how future DOD radar systems will share the spectrum with commercial communications systems. The team used machine learning to learn the behavior of ever-changing interference in the spectrum and find clean spectrum to maximize the radar performance. Once clean spectrum is identified, waveforms can be modified to best fit into the spectrum.

This research is part of a larger defense program to implement adaptive signal processing and machine learning algorithms onto software-defined radar platforms for autonomous real-time behavior.

"With development of this algorithm, this capability is fast-tracking from a concept to a Defense program of record in less than eight years," Martone said. "This is a notably expedited cycle compared to the more typical 30 -year cycle, which will more quickly provide secure communications for Soldiers."

The team is leading future research and development efforts to make cognitive radar possible and sharing new research areas within the radar community, with the intent to continue development using more advanced software-defined radar platforms.

The team published its research, Deep Reinforcement Learning Control for Radar Detection and Tracking in Congested Spectral Environments, in the peer-reviewed journal, IEEE Transactions on Cognitive Communications and Networking.

Preparing the Visual Information shift

Sgt. 1st Class Heather A. Denby
Army Public Affairs Center

Enlisted Visual Information specialties are realigning with Public Affairs under the Communication proponent known as the Army Public Affairs Center (APAC) by October 1, 2022.

Army Visual Information enlisted specialties serve in a number of prestigious assignments including the Army's only active duty Combat Camera unit: 55th COMCAM at Fort Meade, MD, the White House Communications Agency in Washington, DC, and the Psychological Operations Battalions at Fort Bragg, NC.

The VI legacy will remain under the Signal Corps heraldry at the U.S. Army Center of Military History and their documentation can be viewed publicly by visiting the Defense Imagery Management Operations Center.

In October 2019, the "engagement" between Visual Information and Public Affairs kicked off with syndicate training of all their enlisted specialties through the Mass Communication

A visual information specialist documents military training. Visual information specialists are currently part of the Signal Corps but are slated to merge with Army Public Affairs in FY23.
Courtesy photo

Foundations course at the Defense Information School (DINFOS) at Fort Meade, MD. Visual Information and Public Affairs Soldiers now attend the same 108-day course before continuing on to master their specific skill sets.

The Army is the last military branch to merge its VI and PA force structures, which has allowed for considerable insights from those branches on how best to aid the transition. Although all branches of the military will now merge their VI and PA service members under one common proponency, this “marriage” is unique because it comes during additional consolidation of VI specialties. The Department of the Army directed the merge of the 25M (Multimedia Illustrator) and 25V (Combat Documentation/ Production Specialist) specialties effective October 1, 2021. Then, by October 1, 2022, the enlisted specialties of 25R (Visual Information Equipment Operator-Maintainer), 25V and 25Z (Visual Information Operations Chief) will transfer nomenclatures to 46R, 46V and 46Y respectively and be fully aligned under CMF 46.

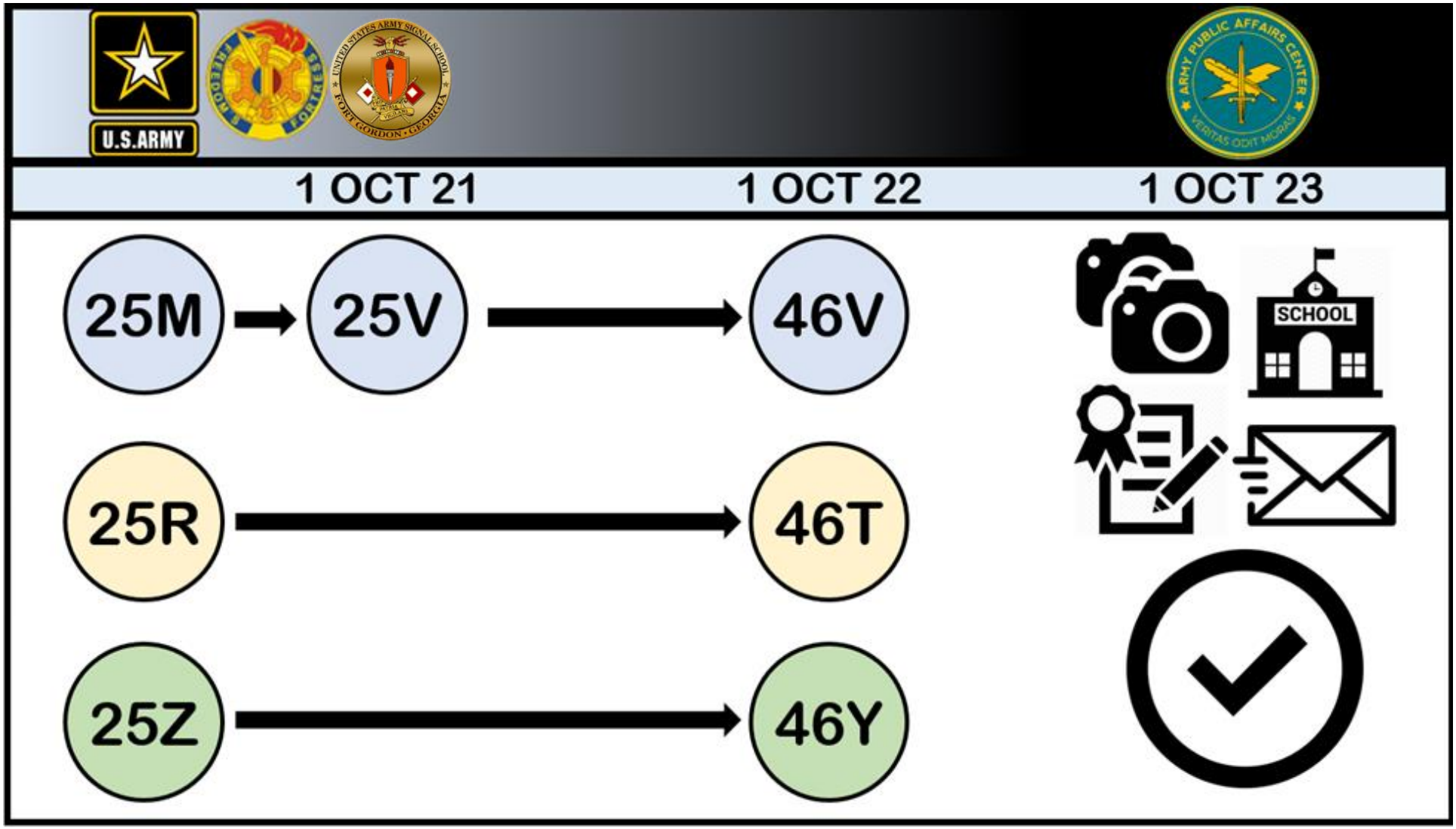
Sgt. Kris Diamond, a Mass Communication Foundation course instructor at the Defense Information School, shows Spc. Justin Nye, a student at DINFOS, key components of peripheral audio recording equipment November 22, 2020. The MCF is a 108-day course that teaches concepts needed in both public affairs and visual information specialties.
US Marine Corps photo by Pvt. 1st Class Austin R. Fraley

The reassignment of Visual Information proponent activities to APAC, as a single proponent for PA and VI, will better integrate the two specialties to meet the demands of the information environment, support commanders’ communication objectives and improve communication capability.

But it’s not just the commanders who will benefit

from this union. Enlisted Visual Information specialty training offers the unique opportunity for Soldiers to expand their skill sets based on the new Advanced Individual Training at DINFOS. Basic journalism writing and storytelling techniques previously taught to only public affairs specialties will now be introduced to all VI Soldiers during their initial training.

Civilians who are currently assigned to Visual Information positions (Career Programs 22 & 34) will continue to train at DINFOS with their enlisted counterparts, as required. However, the marriage of enlisted Visual Information and Public Affairs is currently exclusive. The Civilian Human Resources Agency provides equivalent services and support to the VI civilian workforce.



Courtesy graphic

56th Signal Battalion builds capability through transformation

Maj. Amir Ezzeddine
56th Signal Battalion Operations Officer

The cherished history of the 56th Signal Battalion's colors traversed the sands of Omaha Beach, France during D-Day and operated extensively in Central and South America since the 1980s. The battalion's present day roots are traced back to Operation Just Cause in 1988, where the battalion emerged at Corozal, Republic of Panama with the reorganization of U.S. Army Information Systems Command South, into the 1109th Signal Brigade and the 1190th Signal Battalion (Provisional). Following the removal of General Noriega from power and returning order and democracy to Panama, the battalion headquarters relocated several times within the United States Southern Command (USSOUTHCOM) area of operation. In 2003, upon the relocation of United States Army South (ARSOUTH) to Fort Sam Houston, TX, the battalion established a detachment with ARSOUTH and relocated the battalion headquarters to Fort Gordon, Ga.

Combat Net Radio Platoon conducting training.
US Army Photo

The 56th Signal Battalion's mission expanded with the addition of Geographic Combatant Commander's Communications Teams (GC3T) and was redesignated as a strategic signal battalion in 2012. That same year, the headquarters moved to Fort Sam Houston, TX where it currently resides. Although under-resourced after the redesignation from an expeditionary signal battalion, the battalion stayed true to its roots by retaining the Signal Corps' only tactical combat net radio platoon. The Headquarters and Headquarters Detachment (HHD) and the United States Army Network Enterprise Center Southern Command (USANEC-SOUTHCOM) in Doral, Florida, continue to provide long-haul, tactical radio, and base operations communications support to USSOUTHCOM and ARSOUTH. The newly assigned GC3T mission also expanded the battalion area of operation across North America.

Over the course of the last year, the 56th Signal Battalion adapted and restructured to build capability exponentially in a no-growth environment. The Wolfpack Battalion is entrusted with the mission of enabling USSOUTHCOM and ARSOUTH with strategic long-haul and tactical expeditionary communications. In addition, the 56th Signal Battalion provides the highest quality executive communications to eight general officers by way of the GC3T. Operationally assigned to USSOUTHCOM and ARSOUTH, 56th Signal Battalion is administratively controlled by and a subordinate unit of the Army Network Enterprise Technology Command (NETCOM). Being structured under a Table of Distribution and Allowances

(TDA) enables the battalion to reorganize rapidly. Resourcing under a TDA requires leadership to utilize the Army systems which traditionally enables Modified Table of Organization and Equipment (MTOE) units. This effort will pave the way to operationalize strategic signal battalion missions across the Army. The 56th Signal Battalion has adapted to meet mission requirements throughout its history and the guidon continues to lead from the front.

The 56th Signal Battalion is the sole communications unit designated to support multiple GC3Ts and United States military operations in Central and South America. It does so by providing strategic communications to thirty-seven Security Cooperation Organizations (SCO) across twenty-two Central and South American counties and the USSOUTHCOM headquarters in Doral, FL. The battalion's primary tactical mission is to provide short-notice expeditionary communications for foreign humanitarian assistance, disaster relief, and crisis response in support of United States Army South. In a resource constrained environment, the 56th Signal Battalion, under Lt. Col. Jennifer Colvin's command, conducted a holistic capabilities analysis and applied a DOTMLPF-P approach to significantly increase the battalion's capability in support of both USSOUTHCOM and ARSOUTH. A three pronged reorganization was developed focusing on creating a program of record for the GC3T while also building capability in USANEC-SOUTHCOM and HHD.

Combat Net Radio Platoon enabling the combat paramedic course culminating FTX with communications.
US Army photo

The battalion's GC3T mission is to man, train, and equip the eight teams which provide standardized executive communications to the commanders of: USSOUTHCOM, Army Futures Command, Untied States Army Central, United States Army North, Untied States Army Cyber Command, United States Army Space and Missile Defense, ARSOUTH, and Surface Deployment and Distribution Command. This standardized NETCOM capability level-sets each team via the battalion standard operating procedures and certifies them via the battalion signal gunnery tables. Each GC3T is issued two Executive Communication Kits (ECK). The ECKs are commercial-off-the-shelf which places the lifecycle and maintenance responsibility on the battalion at a significant financial cost. As equipment ages, identifying a sustainable solution becomes crucial. The battalion worked with the Cyber Center of Excellence Army Capability Manger to build the requirement to create an ECK program of record which has yet to be established under the Program Executive Office Enterprise Information Services (PEO EIS). As a program of record, the ECKs would not only be standardized across the Army, but also have an established logistics plan.

By way of a reorganization, the USSOUTHCOM Network Operations

56th Signal Battalion Soldier providing long hall communications during World War II. US Army photo

& Security Center (NOSC) became fully operational on November 8, 2020. From day one, it has met our nation's adversaries head-on in cyberspace. By operationalizing USANEC-SOUTHCOM, the NOSC is able to control timing and tempo in the cyber domain. This allows the Combatant Commander to maintain the initiative and enables him to make key decisions in support of operations. A year in the making, NOSC leadership rewrote and awarded a new $800 million contact, reorganized its civilian and military personnel and worked closely with the Defense Information Systems Agency, Joint Service Provider, and several other mission partners to establish standard operating procedures and exercise the new capability. The pace of this reorganization is commendable. Seldom have units created a NOSC in a headquarters, let alone in a four-star combatant command in under a year. Adm. Craig S. Faller, the United States Southern Command Combatant Commander, recognized the team for their hard work and lasting positive impact to USSOUTHCOM.

With Maj. Gen. Daniel R. Walrath at the helm, United States Army South also operationalized its growing mission in Central and South America and relies heavily on the 56th Signal Battalion to enable mission command. The Battalion's current capability is limited to a combat net radio platoon, which is why the requirement to add an additional signal platoon in Headquarters and Headquarters Detachment (HHD) became evident. Battalion leadership quickly developed a no-growth solution transferring fifteen military billets from USANEC-SOUTHCOM and the Colombia Security Cooperation Office to HHD in FY22. The signal platoon is being resourced with a material solution supported by an ARSOUTH command endorsed Operational Needs Statement (ONS). ARSOUTH is the only Army Service Component Command without dedicated digital signal assets requiring frequent requests for forces. Once fielded, HHD will grow its digital footprint from zero to fourteen supported command posts simultaneously. Furthermore, leveraging current technology allows for scalable communications platforms to enable a Joint Force Land Component Commander. In an era of highly complex battlespaces, the ability for HHD to provide the network transport for critical situational awareness to the common intelligence picture (CIP) and the common operational picture (COP) keeps commanders ahead of the adversary's decision cycles. Working closely with NETCOM, the placement of the newly acquired equipment on the proper Table of Organization and Equipment (TOE) has long term mission and logistical support implications.

Over the coming year, the Wolfpack Battalion will continue to transform at USANEC-SOUTHCOM, HHD and the GC3Ts into a more capable force, ready to accomplish any mission. Human capital is the 56th Signal Battalion's greatest asset which enables it to adapt and restructure. Maintaining a highly trained and capable force is top priority. The 56th Signal Battalion remains ready, and will continue to train vigorously to sustain the competitive edge over the adversaries of the United States.

Project Warrior from a Signal Perspective

Cpt. Michael J. Kocsis and Cpt. Rob Villareal
Signal Captains Career Course
442nd Signal Battalion, 15th RSB

Project Warrior (PW) program began in the late 1980s, as Vietnam veterans retired, and the Army started to lose Soldiers and Officers with combat experience. In order to retain that experience of direct action combat, the program selected top talent from across the maneuver branches and would send them to be observer / control / trainers (OC/T) at Combat Training Centers (CTCs). In the summer of 2013, Army Chief of Staff Gen. Ray Odierno announced the re-establishment of Project Warrior to help the Army transition from a force focused on counterinsurgency operations to a smaller, more versatile Army, one ready for a wide range of missions.

Project Warrior remains a highly selective program designed to spread the expertise developed by either a Battalion S6 or Signal Company Commander across the rest of the Signal force. The Project Warrior Officer will serve as an observer / control at a Combat Training Center (CTC), followed by an assignment as Small Group Leader (SGL) at the Signal Captains Career Course. In order for the Signal Regiment's Project Warrior program to succeed, we must endorse and attract the right leaders to the program.

The program has three different acceptance points. Cohort 1 is the most common point of entry and starts at Signal Captains Career Course (SCCC). Current PW Officers performing as SGLs, identify top performing Officers within their respective class. Cohort 2 includes Officers who are currently serving in their key developmental (KD) assignment. These Officers should be identified by their respective Commanders or Division G6's. Signal Branch CPT Career Managers also inform and recruit during unit visits and Officer interactions. Cohort 3 includes Officers who are assigned as OC/Ts and are nominated by the Commander of Operations Group while at a CTC. Once nominated, Human Resources Command (HRC) and Signal Branch review each Officer's file to assess its quality and to ensure that being selected will not hinder the Officer's professional timeline.

Many Officers ask themselves: "Why Project Warrior?" This is a difficult question. According to Lt. Col. Rett

Project Warrior Member instructs SCCC students on MDMP and Mission Command over a map of their Operational Environment.
Photo by Cpt. Jonathan Edmunds

Burroughs, the Senior Signal Trainer at the National Training Center, “Project Warrior is like a cheat code in a video game. You get all the answers to the hardest job in the Army before you come out here for YOUR rotation as a BDE S6. You are almost guaranteed success.”

While the program may not offer the most luxurious of assignment locations, it places Officers on a definitive track, ultimately taking those lessons learned from their KD Assignments and CTCs to the Signal School House. Once an Officer is accepted into the program, they will receive the Project Warrior fellowship on their ORB. Maj. Patrick Davis recently completed the interview process at CGSC and said, “Warrior is like a cheat code in a video game. You get all the answers to the hardest job in the Army before you come out here for YOUR rotation as a BDE S6. You are almost guaranteed success.”

Once an Officer is accepted into the program, they will receive the Project Warrior fellowship on their ORB.

“The PW namesake doesn’t turn heads, but the PW experiences and PW stamp on my ORB, allowed me to get my foot in the door with senior leaders,” Davis explained. “Commanders at all levels are looking for their field grade Officers to understand and be experts in maintenance, CUOPS/FUOPS, orders process and MDMP. You will receive a master’s degree in these areas as an OC/T, then you will refine your knowledge as a SGL. Ultimately, the PW experience lead me to receive the coveted 1:1 market match within the AIM market.”

Observer Coach Trainer looks on as rotational unit establishes their Retrans Site.
Photo by Cpt. Robert Villareal

As Officers embark on their course through Project Warrior they are exposed to a multitude of different situations, experiences, leadership styles, decision making techniques, exercises and any number of other elements that help shape their ability to perform as Signal Officers.

The Signal Regiment has, throughout the years, prided itself on world class support to the War Fighter. When asked how the Project Warrior program would benefit the Signal Regiment, the current 7th Signal Commanding General, Brig. Gen. Christopher Eubank, stated “The benefits to the Regiment are that these Officers are coming back from these PW assignments with a depth of knowledge that will allow them to support the warfighter better every day. They will be better leaders and teammates and ultimately they will be better communicators.”

The Project Warrior program takes the experience gained from multiple, immersive training events that reinforce Army core competencies and capabilities and infuses that knowledge to the force through professional military education. The Project Warrior program creates leaders who understand current doctrine, have seen it implemented, and can visualize and describe its implementation. Senior leaders within the Signal Regiment must promote and understand the Project Warrior program in order to develop agile and adaptive leaders874 who can win the fight in a multi-domain battlefield.

First into space: 75 years ago the Signal Corps touched the moon

Steven J. Rauch
Signal Historian

During the past few years there has been much interest and excitement about the establishment of the newest military service – the US Space Force. The concept of domains of warfare – land, sea, air, cyberspace, information and space - has served as a way to categorize and understand how warfare might be conducted in those environments. The debate about whether a domain is the realm of a single service or includes all services capable of multi-domain operations is still being sorted out regarding the capabilities needed to win conflicts in a particular domain. The space domain has existed for viable human activity for only 75 years and the first military service to operate in space was the US Army. On January 10, 1946 the Signal Corps successfully sent a radar signal from the earth to the moon and back. It was the first time in history that something created by man was intentionally projected beyond the earth, made contact with a celestial body 238,000 miles away and returned to its origin all in a period of 2.5 seconds. Space history was made and it was made by the US Army Signal Corps.

Project DIANA was the name for the investigations conducted by the Signal Corps to explore the limits of radio waves, specifically radar, and determine how those waves would or could operate in the vacuum of space. According to Maj. Gen. Harry C. Ingles, the Chief Signal Officer, the objective was to demonstrate that radio waves in the very high frequency (VHF) band could penetrate earth's ionosphere as well as any unknown barrier possessed by the moon. These explorations were led by Lieut. Col. John H. DeWitt Jr. and personnel of the US Army Signal Corps Laboratory at Camp Evans near Belmar, New Jersey immediately at the end of World War II. To ensure some degree of secrecy they named the project after the mythological Roman goddess of the moon, Diana. In doing so, the Signal Corps unintentionally established the precedence of naming major space exploration projects after mythological gods, such as Mercury, Gemini and Apollo. Maybe it was a twist of fate that Diana, the first project to remotely touch the moon, was also the twin sister of the Greek god Apollo, whose name is forever linked to the pro-

Radar antenna used for Project Diana, the first time a radio signal was sent beyond the earth and reflected off the moon on January 10, 1946.
Signal History Office collection

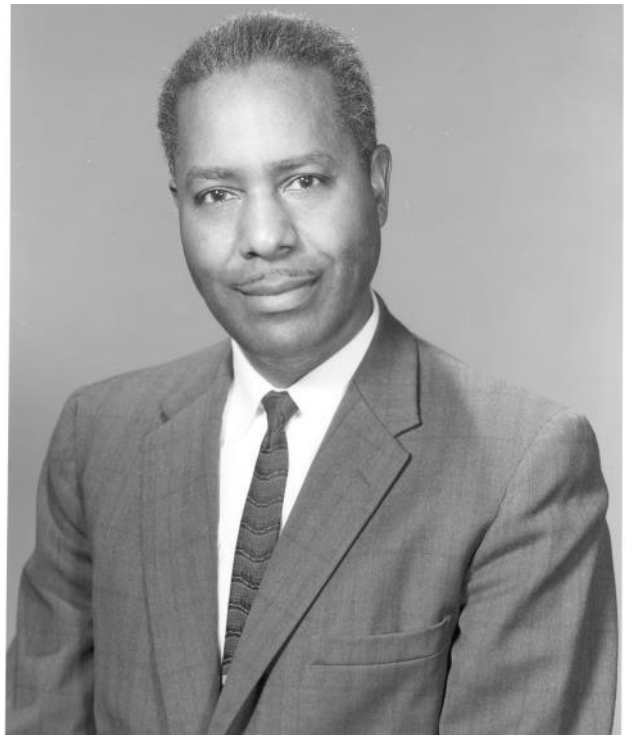
gram that enabled man to physically touch the moon.

Before World War II scientists had conducted experiments directing radio waves at the ionosphere to determine if they could be skipped off the barrier to project transmissions beyond the curvature of the earth. It was believed that part of the upper atmosphere composed of ionized gas was causing low to medium frequency radio signals to reflect around the globe. Scientists in Great Britain conducted experiments using a technique known as pulse-ranging to determine the height of the layer, which in 1924 was discovered to be 90-150 kilometers above the ground. The result of this inquiry led to ideas of bouncing radio waves off of objects, such as ships and airplanes, to determine the distance and direction of the resulting echo. The product of all this was radio detection and ranging - RADAR – which quickly proved to have military application for detecting attack from the air or sea.

Lt. Col. John H. DeWitt, Jr. the team leader and inspiration for Project Diana
Signal History Office collection

The idea of using radio waves as a way to touch something at great distances opened up new realms of scientific inquiry not limited to military matters. Men with amateur interests, such as Nashville radio station engineer John H. DeWitt Jr., built his own equipment to try to bounce a radio signal off of the moon. DeWitt however was forced to put his experiments on hold when the US entered World War II. DeWitt's engineering and radio background enabled him to qualify for an appointment as Signal officer and even more fortuitously, he was appointed director of the Evans Signal Laboratory in 1943. Under the direction of DeWitt, the laboratory's major focus was improving radar design by experimenting with various antennas and power sources.

When the war ended in September 1945, DeWitt began to apply the resources of the Evans laboratory to modify radar equipment to measure ever greater distances. He returned to his pre-war inquiry that if radio waves could be bounced off ships, aircraft, buildings, and the ionosphere, why couldn't a signal be projected to bounce off objects beyond the earth, such as the moon? If radio could be projected into space then it might enable men to direct and control equipment, such as rockets and



Dr. Walter S. McAffee, Chief of the Signal Corps Laboratory Mathematical Analysis Section who provided the computations to enabled the radar to accurately target the moon.
Signal History Office collection

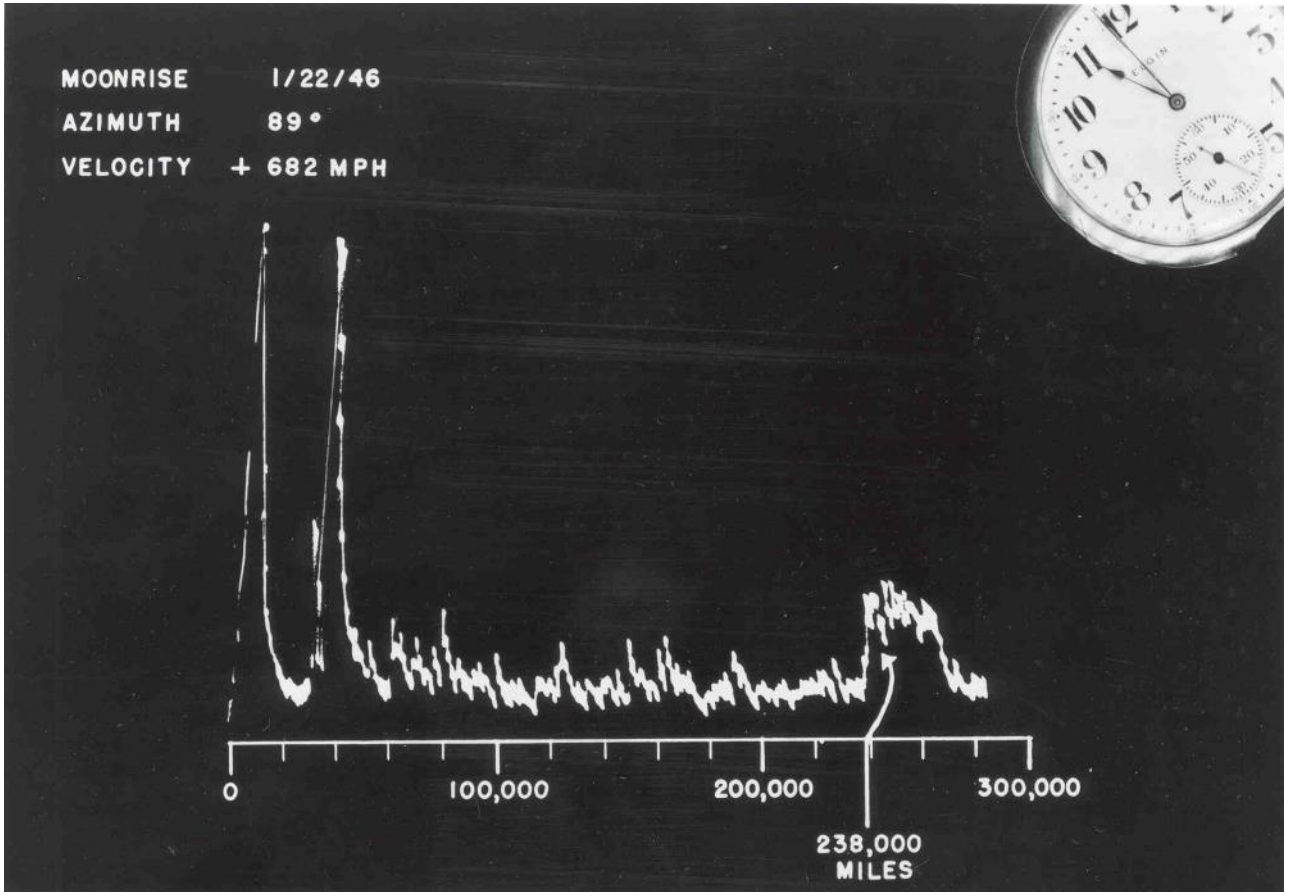
communications relay satellites, ideas that were limited by existing technology. Given the great leap in rocket propulsion by the German V2 rocket program, as well as the practical application of jet engines on aircraft at the end of the war, the day would soon arrive when high power thrust velocities could project objects beyond earth's gravity. But none of that could happen unless it was first determined if radio waves could penetrate the ionosphere and return in the same state they had departed.

Members of DeWitt's group included E.K. Stodola, Dr. Harold Webb, Herbert Kauffman, and Jacob Mofenson who had worked on radar at the labs. One of the biggest challenges was to break the mental concepts of radar being limited to hundreds of miles and instead reengineer existing technology to reach hundreds of thousands of miles into space. Another challenge was to harness a target that moved in different dimensional directions every day. This required the work of laboratory mathematicians such as Dr. Walter S. McAffee and his Mathematical Analysis Section to compute the constantly changing spatial relationship between the earth and the moon. The constant movement also had to be synchronized with the exact time the signal was to be sent. The variables of movement also produced the Doppler Effect that impacted the frequency of the radio waves. Calculations thus were needed for the relative speeds of the earth and moon, the Doppler Effect and location of the transmitter in both time and place in New Jersey.

Overview of the Project Diana facility at Camp Evans near Belmar, New Jersey. Signal History Office collection

The equipment for this experiment was the standard radar set used by the Signal Corps during World War II, an SCR--271 that consisted of a transmitter, receiver, antenna system, and indicator. The transmitter sent bursts of radio energy at specific intervals known as pulses. The receiver listened for any echo reflections of the pulse on distant surfaces. An audio amplifier created the sound of the pulse, usually a blip or ping of some sort and an oscilloscope displayed the image. The time between pulses and their echo measured the distance to the object based on the speed of light or 186,000 miles per

second. Modifications were made to the SCR-271 to increase the normal range. The 3 kilowatt transmitter was modified to provide an output of 50 kilowatts and the frequency was raised to 111.5 megacycles. A slower pulse rate was needed to allow the signal to make the 476,000 mile round trip from between the earth and moon before another signal was sent. The pulse had to be from ¼ to ½ second in duration every five seconds to ensure a strong reflection signal was received. The antenna was a large billboard or bed-spring type 100 feet off the ground modified from an array of 32 dipoles to 64 dipoles. The effective radiation was increased to 10 megawatts. There was a limitation with the range of motion of the antenna. It could only move horizontally which limited experiments to 15 minutes at moonrise and moon set. The most important element, the receiver, had to be modified for extreme sensitivity since the strength of the echo signal would be only 3-watts to a few tenths of a watt. A loudspeaker was added to provide an audible sound of the faint echoes. Finally a 9-inch oscilloscope calibrated in hundreds of thousands of miles rather than miles, was used to display the echo.



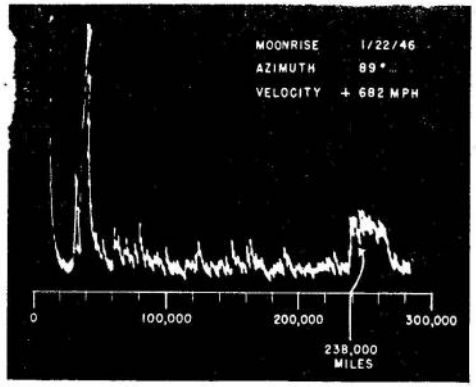
Oscilloscope image showing the return image of the radio pulse during a later shot at the moon on January 22, 1946.
Signal History Office collection

All of the preparations for testing were completed on January 10, 1946. That day the moon rose in Belmar, New Jersey at 11:48 am. DeWitt and his team activated the radar and sent the first radar wave skyward. Almost immediately the first echoes appeared on the oscilloscope and a low hum emitted from the speaker – it was the voice of the moon! Timing of the wave indicated that it took 2.5 seconds for the echo to return, having traveled almost half a million miles to the moon and back. DeWitt and his engineers were convinced they had hit the moon because there was nothing else in that direction that could have reflected the wave. More testing of course had to be made. DeWitt stated, “We knew our months of thinking, planning, cal-

culations, and design were on the right track, but to make doubly positive and sure, as our Army Laboratories must be, we aimed our radar beam at the rising and setting satellite time and time again, so that we knew without question of a doubt that our pulses were striking the moon and echoes were rebounding back to earth."

The first earth to moon transmission had been established. Not only was it the longest distance a radio beam had travelled but it was the first to confirm that it could be done through space. This touching of the moon also validated the larger realm of scientific knowledge because it proved the Copernican theory that the moon was a material body, thus dispelling any lingering myths that the earth was a concept to itself and objects in the sky were merely a stage background for the theater of mankind.

A few weeks later, the accomplishment was announced to the world. The opening of the gateway to the celestial realm immediately affected science in many ways. Radio waves could be transmitted through the bands and layers of the atmosphere in both directions making it viable to maintain radio contact with technology such as rockets and missiles. Instead of limiting exploration to optical telescopes, the objects contained in space could be de-



HISTORIC IMPULSES are shown in this photograph of radar screen used in contacting moon. Scale of miles at bottom was added by Signal Corps to indicate distance at which impulses hit satellite. Large upsweep at left indicates start. Tiny pulsations between there and bump indicating return of moon-reflected radar waves are result of minor interferences. Associated Press Photo

HERE'S what it looks like on moon, according to American Museum of Natural History artist Thomas Voter. Since moon has no atmosphere, visitors from earth would have to wear diving suits supplied with oxygen.

Radar Contact With Moon Opens Vast Fields for Planetary Research

By MALCOLM LOGAN

Vast possibilities for extension of human control over the physical world were opened today by the announcement of Army scientists that for the first time, contact had been made with the moon by means of a new and powerful radar.

On Jan. 10, and several times since, signals sent out from the Evans Signal Laboratories at Belmar, N. J., pierced 238,000 miles of interplanetory space to reach the moon and, reflected back in 2.4 seconds, were recorded visually and audibly in the laboratory.

The War Dept. said the achievement promised "valuable peacetime as well as wartime applications."

mong its possible applications are ultimate topographical mapping of the moon and other planetc, improvements in radio transmission, detection of enemy missiles flying through cosmic space and radio control of such jet or rocket bombs by the nation launching them.

H. E. Burton of the Naval Observatory in Washington told the Associated Press that if the radar range could be increased to 35,000,000 miles, it might be possible to probe the secrets of Mars and even settle the long-debated question whether there is any life there.

Australian Disputes

The Army's claim of the first radar contact with the moon, made at a dinner of the Institute of Radio Engineers at the Hotel Astor last night, was challenged by W. E. Osborne, former Australian Army major now doing secret research for the U. S. in Los Angeles.

He said, the Associated Press reported, that in October or November, 1941, he and other scientists in Australia under the direction of Dr. J. H. Piddington at the University of Sydney, using a high-powered experimental radar, contacted the moon several times.

Maj. Gen. George L. Van Deusen, chief of engineering and technical service of the Army Signal Corps, said in his address last night that the radar which reached the moon was basically the same instrument that detected the approach of Japanese planes at Pearl Harbor.

Jagged Echo of the Moon

The echo from the moon was recorded by jagged, saw-tooth lines on an oscilloscope and was also heard in the laboratory through a loud speaker as a note a little higher pitched than the hum on a radio when it is not tuned to a station.

Until the feat was accomplished, scientists had doubted whether radio wave could pierce the electrically-charged ionosphere which envelopes both the earth and the stratosphere and is about 250 miles in depth.

The man who contacted the moon said any doubt that they had succeeded was dispelled by the fact that the echoes showed the Doppler effect, caused by the fact that the distance between the moon and the earth was changing while the experiments were in progress.

Contacts at Moonrise

Some of the contacts were made at moonrise when the earth is traveling toward the moon at the rate of 750 miles an hour, and others when the moon was setting and the earth was moving away from it at the same rate.

As a result of this movement, the radio waves did not return at the same frequency as they were transmitted. Precise calculations were made concerning the change in frequency and the echoes returned on the calculated frequencies.

The moon radar, speakers at last night's meeting explained, differs from conventional radar in several respects. The ordinary radar uses pulses of a very short duration—about twenty millionths of a second—whereas the moon set used a half-second impulse.

Special Equipment

The prevent the set from being burned out from the tremendous energy it transmits, water-cooled vacuum tubes were used. A specially constructed peep sight was used for aiming the double-sized antenna.

"Project Diana," as the Army called it, was directed by Lt. Col. John H. De Witt, former chief engineer of Station WSM, Nashville, Tenn. He was assisted by E. King Stodola, Dr. Harold D. Webb, Herbert Kaufman, and Jacob Mofsenson, the latter a New York man and a graduate of City College.

In the study of the vast regions of interstellar space, scientists believed ,the contact with the moon might be as significant as was the explosion of the first atom bomb in New Mexico on July 16, 1945, in the study of the atom.

Quill Corrects Post Error

Lise Meitner, Atom Heroine, Reaches N. Y.

Dr. Lise Meitner, 67, the Viennese scientist whose prewar experiments with atomic energy led to development of the bomb, arrived at LaGuardia Field today.

Met by relatives who seemed bent on protecting her from making any statements, the famed scientist was talkative about just that one subject: that she couldn't say anything.

An Overseas Airliner bringing Dr. Meitner and 19 others arrived a half-hour ahead of schedule. She was met by her sister, Mrs. Frieda Frischauer, New York; a

DR. LISE MEITNER

brother-in-law and sister, Mr. and Mrs. Rudolph Allen, Washington; and a nephew, Stephen Allen.

The Allens are members of the faculty of Catholic University in Washington, where Dr. Meitner, a Jewess, is to become a lecturer in the physics department Feb. 1.

Newsreel and camera men crowded around the scientist as she breakfasted at the airport on juice, coffee, doughnuts and pastry.

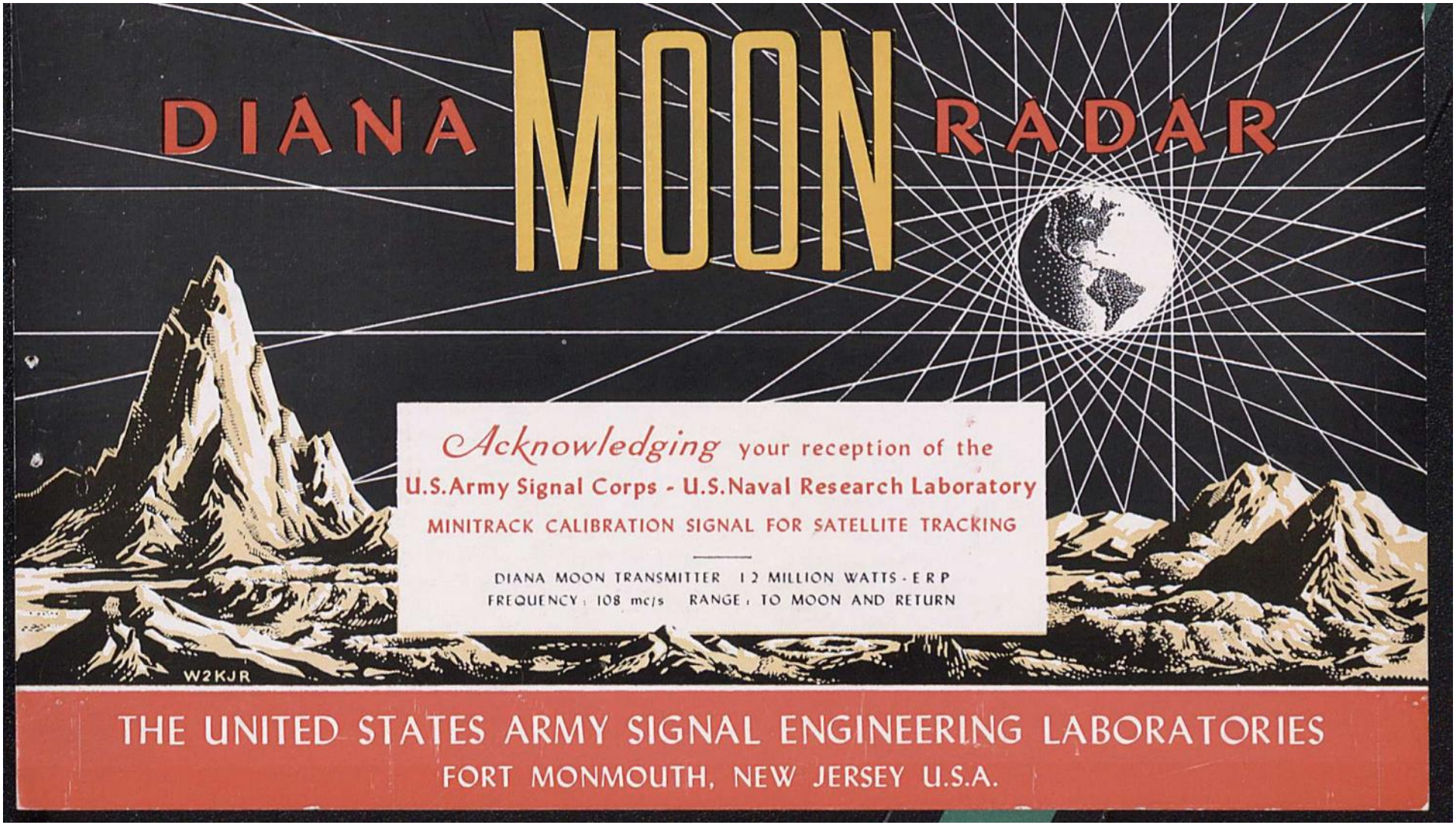
Expelled From Germany

"I cannot talk," she insisted patiently. "Not now. I'm so tired. Later, when I come back to New

NEW YORK POST, FRIDAY, JANUARY 25, 1946

New York Post headline January 25, 1946 announcing the success of Project Diana. Signal History Office collection

tected using radio telescopes. More immediately, the ability to expand communications using satellites became feasible, but until then, the moon would serve as the only satellite to reflect signals using earth-to-moon, or moon bounce communications. Project Diana thus enabled man to examine, explore and at times physically occupy the space above the earth to include physically landing on the moon during the Apollo space program. So to the brand new Space Force, please accept a warm “your welcome” for your job from the US Army Signal Corps who, once again, made possible the birth of another institution.



In later years ham radio operators who reported hearing transmissions via earth-to-moon transmissions received a souvenir QSL card from the Army station.
Signal History Office collection


In the next
ARMY
COMMUNICATOR
Serving
Abroad
PRO PATRIA VIGILANS